THE MAC Flyer

September 1987

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THE MAC Flyer

For Greater Safety in MAC Air Operations

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The MAC Inspector General on Safety

Interview by Major Thomas C. Weinzierl
Supervising Editor

(Editor's Note: Brig. Gen. Floyd E. Hargrove assumed duties as the Military Airlift Command Inspector General in July 1987. Prior to this assignment, General Hargrove served as vice commander of MAC's Twenty-Third Air Force. General Hargrove has held a variety of positions including commander of Detachment 2, 552d Airborne Early Warning and Control Wing, Keflavik Naval Air Station, Iceland; 1550th Combat Crew Training Wing, Kirtland Air Force Base, New Mexico; and 314th Tactical Airlift Wing, Little Rock Air Force Base, Arkansas.

General Hargrove is a command pilot with almost 7,500 hours flight time, including more than 1,000 combat hours in the Republic of Vietnam.)

TMF—General Hargrove, please tell us a little about your flight experience.

IG—I'm fortunate to have been an active flyer for nearly all my career. I've flown about 7,500 hours in 40 different types and models. I believe the Air Force is about flying and I've always tried to fly as much as possible.

TMF—Were there any experiences that were instrumental in forming your safety philosophy?

IG—That answer can be boiled down to one word—mishaps. Anytime you lose friends or see valuable government equipment damaged because of dumb mistakes, it has an impact on your thinking and makes you a strong believer in safety.

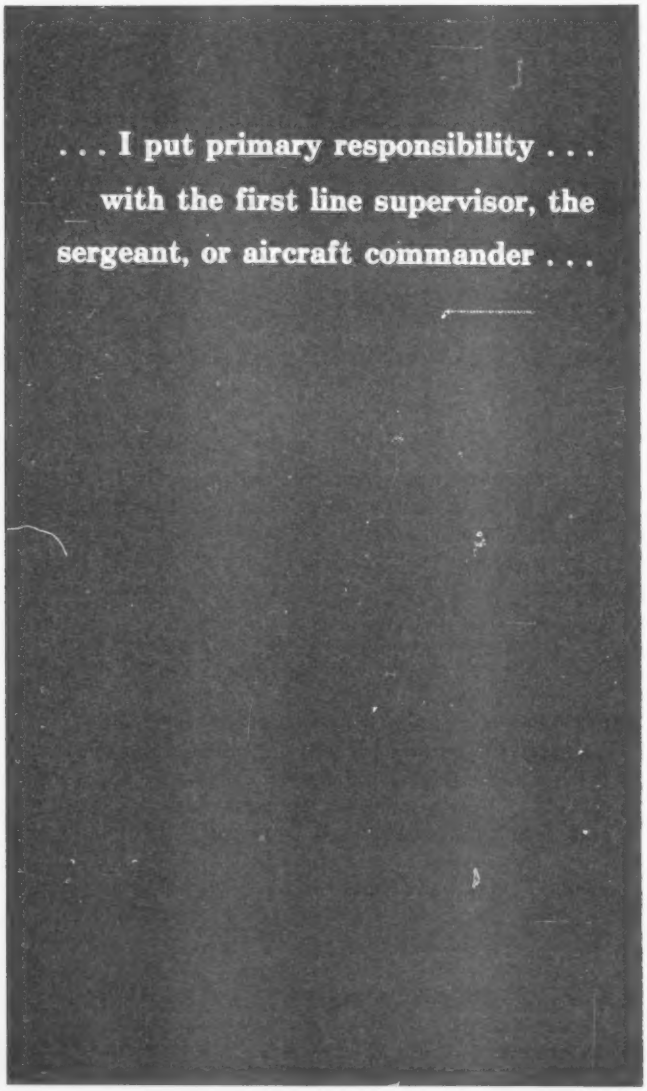
TMF—You've held commands ranging from detachment to wing level. How do you view the commander's role in safety?

IG—Vital; however, I put primary responsibility down to a much lower level than the commander—it starts with the first line supervisor, the sergeant, or aircraft commander.

TMF—It seems we consistently "do it to ourselves" with about two operations-related mishaps for every materiel-related mishap. How do you believe we can reduce this trend?

IG—Involvement by first-line supervisors, situational awareness, and crew coordination. The pilot can't do it all himself—he needs help and he should insist on getting it.

TMF—We have a lot of resources available, but what do you think is our biggest asset in mishap prevention?



IG—The obvious answer is our people. They must maintain their commitment to safe mission accomplishment regardless of budget cuts and other difficulties.

TMF—Conversely, what is our biggest obstacle to preventing mishaps?

IG—Again, our people; specifically those who refuse to believe or do not think they have a responsibility to make an impact on mishap prevention.

TMF—To many crewmembers, moving the mission—making the on-time departure—and safety seem to present a real conflict. How do you view this situation?

IG—I don't see a conflict. The mission must come first, but one can't complete the mission without considering safety. We have a job to do so let's figure out the safest way to do it.

TMF—The safety program is vital to every commander. Do you have any advice for commanders in developing and running their safety programs?

IG—Be involved and insist all others are involved. As in every other area of command, the commander leads the way.

TMF—Do you have any advice to offer MAC safety people?

IG—You should not be held responsible for mishaps but should be held responsible for the safety program. Have you done everything possible to aid those supervisors? How is your education program? Are you analyzing mishaps and spreading the word on your findings? Are you flying with crews and visiting offices and shops? You should constantly strive to better the work environment to make it as safe a place to work and/or fly as possible.

TMF—During your tenure as Inspector General, what will be the overall objective of your safety efforts?

IG—To increase safety awareness in the field. We in MAC, on average, crash four aircraft a year—that is just not acceptable. Each of those mishaps can be avoided if everyone has the attitude of "know your job and do it well."

Thank you, General Hargrove.

PRESS ON

by TSgt. Bruce F. Hanke, ANG
163 TFG, March AFB, California

I could barely see the darkened shape in the gray mist as I stared through the open flap of my hooch. The warm monsoon rain hummed steady on the tin roof. It'd been raining for the past three days, and I wondered if I was going stir crazy. Before today, I hadn't paid much attention to the old C-130, or how it had gotten there in the first place. But now it seemed to be calling me.

Third Place Winner 1987 Flight Safety Writing Contest

I'd been in Vietnam nearly eight months, and although the old A-model Herk had lain out there in the sand for who knows how long, I'd just taken it for granted. It was part of the landscape.

We flew F-100s at Tuy Hoa—in fact we were the biggest F-100 unit in Vietnam, flying close air support for ground units. There were a few search and rescue C-130s at Tuy Hoa, but this old Herk hadn't been one of them. I knew that much for sure. But where had it come from, and why? We'd been virtually grounded because of the monsoons, so there was plenty of spare time. A break in the war. At least the VC would be slowed down as well.

I guess I'd been sitting there for a couple of hours, just staring. My hooch was at the end of the row of flimsy metal barracks, each surrounded by sandbag bunkers. There weren't any glass windows,

but the metal flaps could be raised or lowered to keep out wind and rain. The semi-darkened interior depressed me, so I raised the flap enough to see out and let the gray light in.

And let that old C-130 beckon me.

I can't really explain the feeling which seemed to pull me out, but I gathered on my poncho and headed out in the direction of the wreck.

The wet, mushy sand and steady downpour slowed me down a bit, but about fifteen minutes later I was there. The camouflaged fuselage loomed before me, hauntingly. It was still intact, although somewhat crumpled. The wings and part of the tail section were gone. There was no landing gear, and it lay at a slight angle in the sand. I caught a flicker of something moving out of the corner of my eye. Was someone on the flight deck?

Cautiously, I crept toward the open entrance door, not sure what I would do next. I wanted to turn and run, but something seemed to attract me like a magnet. Stepping into the semi-darkened interior, I felt a small bit of relief at getting out of the rain. It drummed rhythmically on the hollow fuselage, amplified to a soft roar. I eased up the ladder to the flight deck, noting that most of the instruments had been stripped from their panels. With the exception of the engineer's and copilot's seats, there wasn't much else up there.

I stepped over to the pilot's side windows and peered out the partially fogged glass. I could just about see the coiled concertina wire of the perimeter and the guard towers about a half mile off.

What am I doing here? How did this thing get out here? I wondered aloud.

"I think I can answer that," said someone softly.

I spun quickly around, my heart pounded as fear grabbed me. Someone was sitting in the engineer's seat. "Who are you?" I asked the man sitting there. "I didn't see you when I came in."

"I know," he said. "It doesn't really matter who I am. But I'll tell you anyway. My name is Allen. Ken Allen. I was the engineer on the last flight of this plane. I can tell you exactly how it got here. Would you like to know?"

"I've always wondered about it. Yeah, I'd like to know." I was a little tense by now.

"We were at Da Nang, two years ago, starting out on a two-day run through I and II Corps. Part of our mission was resupply at Dong Ha and Khe Sanh, then an RON at An Khe. The second day we flew to Plei Me to deliver 105s and C-rats. The last leg was to take a bunch of troops we'd picked up along the way to the Freedom Bird at Cam Ranh Bay." He paused a few seconds and continued.

"The mission started out a little shaky. We lost number 4 DC generator on takeoff, but I told the pilot to press on. I felt the Marines needed us more than we needed that generator. So we went into Dong Ha first with no problems and unloaded our cargo there. I padded the number 4 generator while we were on the ground and then we immediately cranked up for Khe Sanh. Five minutes after takeoff, we lost the number 2 AC generator. With only the number 3 and emergency left for AC, we had a very narrow margin of safety. But again I told our aircraft commander this was war, we could fix it later. *Press on.* I had to be a little more observant by then, but the approach to Khe Sanh took my mind off the airplane. We took small arms fire going in, so our combat assault was real steep. This old bird handled it well, but the emergency hydraulics appeared to have taken a hit. When we applied brakes and prop reverse, brake pressure dropped too, and never recovered above a thousand pounds. We got her stopped okay, but the VC started shelling us. They walked the rounds right in on us, but with a little fancy maneuvering, we kept from getting blown to bits. The Marines helped unload us under fire. Those boys were good; scared, but they did a great job out there.

"Three of them boarded with us, and we got outta there 'beaucoup' quick. Their DEROS had been up a couple of days earlier, but we were the first opportunity they'd had to get out.

"Our next stop was an RON at An Khe, an Army Airfield here in the II Corps area. We weren't sure how we'd fare since our hydraulics were in pretty poor shape—we figured we could get in one good braking. We'd have to depend heavily on reverse to stop us."

Sergeant Allen stopped momentarily and stared off into the rain. He seemed to be getting at some particular point. I thought I knew what it might be. He turned and looked at me with a strange look and went on.

"At that point I went back to the cargo compartment to check the reservoirs and plumbing. The reservoirs were a little low, and I couldn't tell right away why our brakes were out, but suspected maybe a nicked line on one of the mains. No sweat, I assured the rest of the crew. We could get by without emergency, and I could fix

the brakes at An Khe. Hell, this is war, time to test our mettle! *Press on!*

"We arrived at An Khe with all four engines still turning, but minus one DC and one AC generator. Our emergency hydraulics were gone, and our brake pressure was questionable. Somewhere along the way, the pilot's attitude indicator decided to go belly up, and the UHF quit. We weren't in very good shape, but the mission came first, so we decided to finish it. We touched down okay, but held our breath. The pilot waited until the last minute for the brakes, and eased the pedal down slowly until we came to a nice easy stop, just short of the end of the strip, naturally. We all sighed with relief and congratulated our AC over that one, let me tell you!

"I decided not to work on the bird that night, because we were beat, and I sure didn't feel like messing with it. The Army boys got us all fixed up for the night, and after a little chow, we managed to wind down and get some sleep after that hectic day.

"Next morning, I got up earlier than everyone else and went out to the aircraft to see what I could do to get the bird back into some semblance of commission. I padded the number 2 AC generator and found a mangled brake line on the left rear main, so I capped the line off and filled my reservoirs. I thought that might just get us through the rest of the mission. A couple of hours later we finally got underway again.

"With our luck, the number 4 prop started fluctuating just after takeoff. But it was borderline so I ignored it, hoping it would go away. Anyway, it was minor compared to our other problems. I guess this old Herk didn't like sitting overnight at an Army field. And in the middle of the jungle at that.

"We took a little more groundfire trying to get into Plei Me, but we got in okay. We unloaded the rest of our cargo and picked up a few more troops to go to Cam Ranh Bay. The guy who marshalled us in told us we should get out ASAP because things were heating up in the back. He didn't have to press us too hard to leave. We were anxious to get this basket case back. So off we went again, one more time. Within the hour we would be down in Cam Ranh."

The sergeant stopped again. This time he just sat and stared for a good three or four minutes before finishing his story.

"We took off and again we took ground fire. When the copilot tried to bring the gear up, it wouldn't come up. Someone down there must've gotten lucky because the number 3 oil pressure dropped to zero and she started smoking pretty badly. It was going to seize up, so we feathered it quickly. At that point we decided to head for the nearest airfield which was here at Tuy Hoa. The damage to the aircraft was much greater than we knew, but we didn't find that out until it was too late. We had lost more than we could afford. The minute we touched down, the number 4 engine quit and we didn't have time to recover. The airplane spun around right off the runway and plowed right into the mud. Equipment flew everywhere. Unfortunately, some of us never made it and some of those poor passengers never made it through their last day in 'Nam.

"Looking back, we only made one mistake throughout the whole ordeal. Do you know what that was?" Sergeant Allen looked right at me.

"What?" I thought I knew what he'd say.

"We pressed on . . ." he began.

". . . .when you shouldn't have." I finished the sentence for him.

I turned away from him and looked out into the pounding rain again. Deep in thought, I halfheartedly said "But sometimes you gotta do what you think is right, don't you?" I turned toward him expecting him to affirm my support, but there was no one there.

"Sergeant Allen?" I said.

"Sergeant Allen?"

I walked slowly back to my hooch,oblivious to the downpour.

★

Following his active-duty Air Force service, Sergeant Hanke joined the Rhode Island ANG in 1973. His experiences with MAC maintaining C-141s and C-130As ended in March 1985, when he accepted a job as an Avionics Instrument Systems Technician with the California ANG working on the F-4C. Sergeant Hanke's entry won First Place in the 1986 Flight Safety Writing Contest.

Mishap With A Moral

POOR DECISIONS RESULT FROM . . . INSUFFICIENT DATA

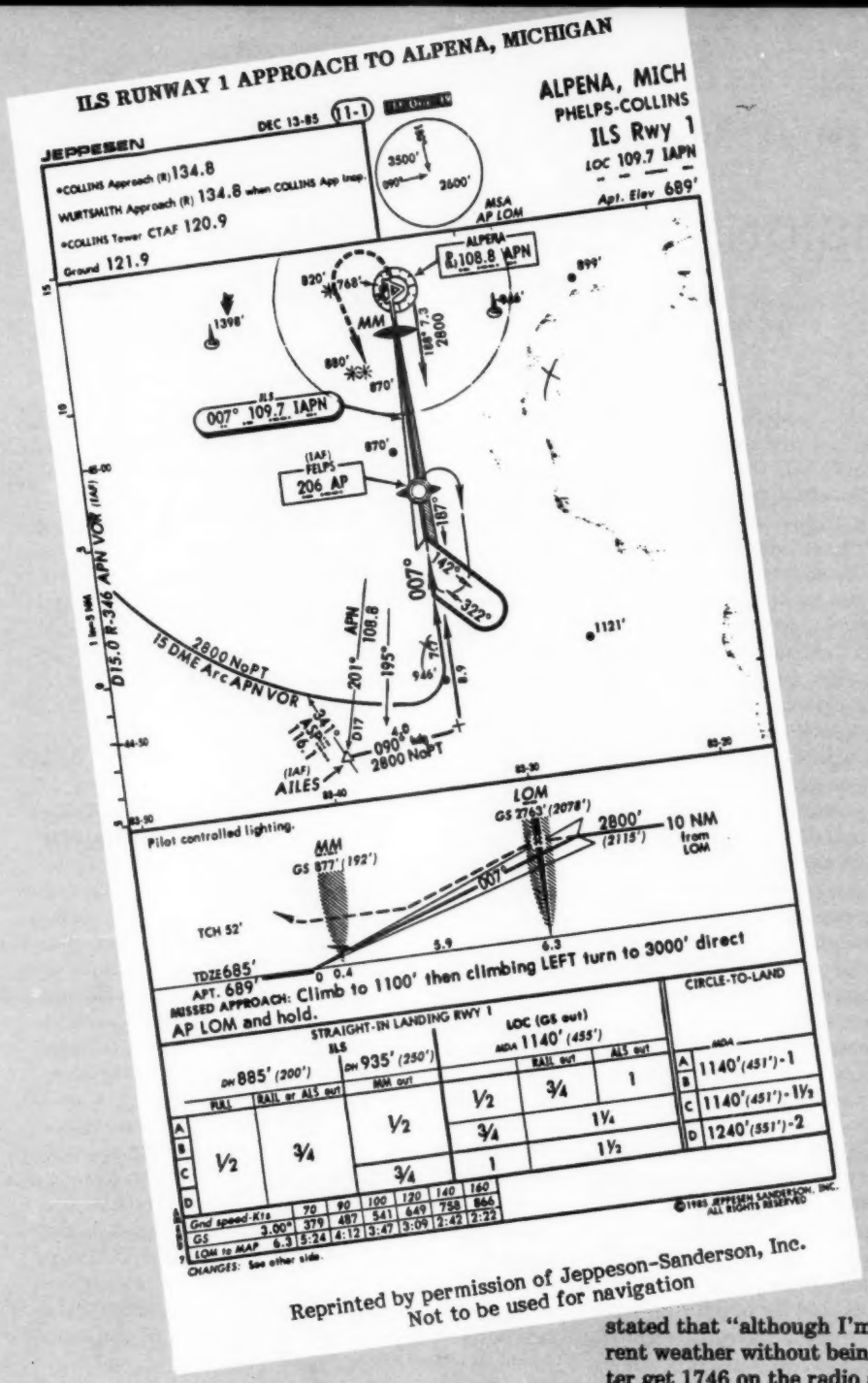
It's a horrible reality that with all the sophisticated gadgetry, complex systems, design advances, training, and warnings, man is still the biggest hazard to flight. The gift of hindsight reveals mishaps where crews had information which should have led them to different conclusions and actions; away from the mishap sequence. But, for some reason, the facts simply weren't used. It's rare any one crewmember would have all the information necessary to avoid a mishap, and then not use it. Instead, reconstruction of a catastrophe often reveals a fragmentation of available information. Each crewmember, according to his assigned tasks, accepts responsibility for "monitoring" a problem which, singly, is a minor irritation, but combined with other "irritants" creates circumstances the crew is powerless to resolve. The result is an information void, despite the fact they collectively knew all the factors. Similarly, there's a gap in comprehensive decision-making when crewmembers fail to crosscheck one another on so-called routine duties. "Never trust anyone" may be carrying the concept unrealistically far, but embodied in this trite phrase is a solid concept—if you aren't personally sure, and it bothers you, ask!

On 13 March 1986, passengers and crew of Simmons Airlines Flight 1746 confronted the aftermath of poor decisions based on insufficient data.

On that day, weather conditions throughout Michigan were poor. As a result, many Simmons flights were cancelled or delayed. The mission departed Detroit at 1800 Eastern Standard Time (EST), two hours after scheduled takeoff. The first shuttle to Toledo was uneventful, and the crew arrived back at Detroit at 1900. After landing, the aircraft was fueled with 122 gallons of Jet A fuel, and the flightcrew was reassigned to fly Flight 1746 from Detroit to Alpena and Sault Ste Marie. Scheduled departure time was 2015.

The captain reported to the operations office where he received weather information for the mission. He reviewed the weather and told the dispatcher he was ready to depart. The dispatcher gave him his flight manifest and release for flight. Flight 1746 was to fly from Detroit direct to Flint, Victor 133 to Saginaw, and finally, Victor 45 to Alpena. They planned to cruise at 8,000 feet. The crew designated Cleveland Hopkins International Airport their alternate.

The crew began the mission at 2037, 22 minutes late. They were airborne at 2050 with 7 passengers aboard. Saginaw ATC handed the flight off to Wurtsmith AFB, the FAA facility responsible for air traffic control in the Alpena area. At 2125, Flight 1746 acknowledged receipt of the latest weather information derived from a 2050 observation taken by a National Weather Service (NWS) specialist at Alpena. The weather observer took a special observation which indicated visibility had deteriorated from the 1/2 mile visibility passed to Flight 1746 to 3/8 miles, below minimums for the approach. The observer entered the new observation in the weather information dissemination system which became available to the Pellston Flight Service Station at 2120. Pellston FSS and Wurtsmith AFB have a direct telephonic link. At 2133, Wurtsmith cleared Simmons Flight 1746 for the ILS approach to Runway 01 at Alpena's Phelps-Collins Airport. At 2142, the crew informed Wurtsmith Approach they'd executed a missed approach. On the ground, the station manager heard the aircraft as it passed overhead. At 2146, the NWS specialist made another special weather observation, which showed station visibility had dropped again, this time from 3/8 to 1/4 mile. Asked their intentions, the crew of Flight 1746 requested a second ILS approach. The station manager stated that about 30 seconds after the aircraft passed overhead, Flight 1746 cancelled and asked him to confirm the runway lights were at their highest level. The manager then asked the NWS specialist if it was possible to do so; he was informed all one could do is tell whether the lights were on or off, not their intensity. He then radioed the crew as far as he knew the runway lights were at their highest intensity. The crew acknowledged the call and shortly thereafter responded to a Wurtsmith request for a PIREP on weather conditions at Alpena during their first approach. They responded: "Okay, we picked up the lights, but . . . I'm not sure what the visibility



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was . . . ." The weather observer, aware of minimum visibility for an instrument approach, informed the station manager Alpena was now below minimum conditions for an ILS approach. The station manager stated that "although I'm not required to give current weather without being asked, I figured I'd better get 1746 on the radio and tell them Alpena was below minimums." He tried several trimes to contact the crew, to no avail. At 2153, the crew was cleared for a second ILS approach to Alpena. At 2156, Wurtsmith asked the crew to confirm they were "on the localizer" and the crew responded affirmatively. Wurtsmith informed Flight 1746 radar service was

terminated and instructed they pass their landing time over that same frequency. The crew of Flight 1746 acknowledged, in what was to be their last transmission.

The aircraft crashed about 1.5 miles south of Runway 01 threshold at Alpena, in 2-3 feet of snow. The aircraft was destroyed by impact; the first officer and two passengers were fatally injured; the captain and five passengers survived.

METEOROLOGICAL INFORMATION

Throughout the evening, widespread rainshowers and drizzle restricted visibility from 1/4 to 1/2 mile. National Weather Service personnel made weather observations indicating, in part, ceilings and visibilities as follows: 2050—ceiling 100 ft, visibility 1/2 mile in drizzle and fog; 2119—ceiling 100 ft, visibility 3/8 mile, light drizzle and fog; 2146—ceiling 100 ft, visibility 1/4 mile, light drizzle and fog; 2154—ceiling 100 ft, visibility 1/4 mile, light drizzle and fog. Since this information should have prompted the crew to pursue an approach to their alternate airfield, the safety board examined the process for disseminating weather information. Wurtsmith AFB was one of 27 Air Force facilities, at the time, providing air traffic control services to some 92 "satellite" public use airports like Alpena's Phelps-Collins Airport.

Once weather observations were made, the NWS specialist entered them into the NWS-operated Automation of Field Operations and Services System. Surface observations were routed through the Systems' Monitoring and Coordination Computer in Maryland and the FAA's Weather Message Switching Center in Missouri to the Saginaw FSS. From there the information was accessible to the Pellston FSS, which was linked by direct telephone line to Wurtsmith. To obtain weather information about the satellite facility they serviced, Wurtsmith personnel contacted Pellston FSS personnel via a "217 shout line" or direct telephone-type land line. Wurtsmith had no other method of obtaining weather information at Alpena. Interviews conducted with Simmons pilots indicated they normally received weather information from Wurtsmith controllers and Alpena station personnel without request, however, Simmons procedures did not require the station manager to pass unsolicited weather information to aircrews. Wurtsmith controllers obtained weather information in compliance with a letter of agreement between Wurtsmith and Pellston FSS calling for Pellston to provide Wurtsmith Approach Control, upon request, all hourly, special, or other weather observations relating to Phelps-Collins Airport until advised they were no longer needed. The FAA's Air Traffic Control Handbook directs controllers to provide current approach information to arriving aircraft on first radio contact or as soon as possible thereafter. A review of the taped transmissions just prior to the accident led the NTSB to question a background comment by one of the Wurtsmith controllers made just after 2133 which stated "(unintelligible) sky and weather is below minimums for approach (unintelligible)." The comment highlighted a difference in the military and civilian approach requirements. Air Force landing minimums require the ceiling and visibility be at or above minimums, but in this instance the ceiling was 100 ft below minimums needed for a military aircraft to conduct the ILS to Runway 01. However, these conditions did not prohibit a civilian aircraft from commencing the approach; FAA regulations permit an approach to be made regardless of ceiling if visibility is at or above minimums.

ANALYSIS

Determining the cause for a crash landing out of an instrument approach flown by an experienced pilot backed up by an experienced crew in a perfectly functioning aircraft posed a difficult problem for the NTSB. Further complicating their task was the fact the mishap aircraft had neither a flight data recorder nor cockpit voice recorder.

Both captain and first officer were properly certificated and the board confirmed the aircraft was in good working order. The NTSB then concentrated their investigation on the final portion of the flight, as there was nothing odd or significant about the mission prior to the final few seconds. Here the investigators sought to answer two independent, but possibly related, questions. Why didn't the crew of Flight 1746 know the current weather conditions at Alpena, and why did they continue descent through decision height? Arguably, one might assert the crew was unaware because nobody kept them informed. Special weather observations clearly showed weather below minimums, but the crew wasn't required to and did not ask for weather updates. The board found the system for communicating updated weather to the crews deficient, contributing to the accident. The safety board determined Wurtsmith controllers, Pellston FSS personnel, and the pilots shared in the responsibility of providing and obtaining updated weather. Specifically, the crew was in the Alpena area and had to know weather was near minimums. They should have asked for updates, especially since they had just executed a missed approach. Wurtsmith controllers, the safety board determined, were aware Simmons 1746 was attempting to land at Alpena, and that Alpena was below minimums for military aircraft. This should have prompted them to ask Pell-

ston if there were any special observations taken since the 2050 routine hourly observation they had last received. The system used is electronic from observation to the FSS, but then it becomes slow and depends on human effort. Controllers at Wurtsmith have to guess if a special observation might be taken, call Pellston FSS personnel, then Pellston personnel, after completing the duties they're already performing, access any new information electronically, and pass it to Wurtsmith. The NTSB found the system unnecessarily cumbersome and suggested providing Wurtsmith the same capabilities to access the information as FAA facilities.

Having solved the first question, the board sought to resolve the question of why a trained crew would fly the aircraft below glideslope and through decision height, especially when they made a missed approach the first time. The board determined since the aircrew executed the first missed approach, the second ILS should have also resulted in a missed approach at decision height. The safety board believed parameters affecting the first approach, such as weather, airplane, the ILS, and condition of the crew, didn't sufficiently change in the short interval between approaches to affect the second approach's outcome. Overwhelming evidence showed the field remained below minimum conditions throughout both approaches. The NTSB concluded continued descent through glideslope and decision height was the major factor leading to this accident. Simmons procedures mandate a missed approach in the event of significant deviations from glideslopes. The point of impact was 300 ft below the bottom of the glidepath. In addition, pilots are authorized to continue an approach below decision height only if they can see specific visual indicators, such as runway lights of the runway in use. The board further concluded these indicators could not have been seen 1.5 miles from the runway in existing weather conditions. The question as to why the crew flew through glideslope and decision height remained. Thus, the board examined crew experience and coordination. Despite their high flying hours (Captain—3,386.6, First Officer—6,271.3) the safety board believed both crewmembers were relatively inexperienced in several important areas. Both were relatively new to Simmons operations hence may not have been aware of occasional rapid weather deterioration in the Great Lakes region. In addition, the captain didn't know the first officer very well and may not have realized he had only accrued 20 hours as a pilot for Simmons; that inexperience may have limited his ability to participate fully in the captain's decision-making process. There were several other factors which led the NTSB to believe the crew conducted the flight improperly. The captain, for instance, relied upon the first officer's approach chart during the approach. The captain's description of this procedure was that it manifested crew coordination. In the board's view, this reflected misunderstanding the importance of a readily available approach chart and of crew coordination and its application to flight operations. The safety board asserted the captain, as pilot-in-command, was responsible for effective crew coordination. The board concluded the crew should have asked for weather updates, especially in light of the missed approach. The first officer even admitted he was unsure of visibility in a transmission to Wurtsmith. The captain answered hypothetical questions concerning possible motivations for the second approach, and his responses indicated he assumed, in the absence of new weather information, there were no changes. The safety board concluded regardless of the extent to which pilots had received unsolicited weather updates in the past, a prudent captain would not assume the weather hadn't changed in a 30-minute period. Finally, the last evidence of failed crew coordination is both pilots should have had adequate indication of significant glideslope deviation. That they continued to descend is, by itself, indicative of a failure to practice crew coordination, contributing to failure to perform a basic flight procedure—an adequate instrument scan.

PROBABLE CAUSE

The NTSB determined the probable cause of this accident was the flightcrew's continued descent, for undetermined reasons, of the airplane below glideslope and through published decision height without obtaining visual reference of the runway.

APPLICATION TO MAC

As we say far too often, this mishap should not have happened. The crew failed to work together, and individually lost situational awareness. But using words like "crew coordination," "cockpit resource management," or "professional competence," without actually understanding them or working to apply them to our flight operations, make them nothing more than "buzzwords" tossed about to impress others. The name any one of us chooses isn't important, pick one! What is important is the composite effort required to fly safely. Whatever its name, crews must share overlapping responsibility, communicate clearly, encourage group problem solving, and take the initiative to maintain one another's situational awareness. Call it airmanship; we can all make a continuous effort to make it work and prevent mishaps.

Adapted from: NTSB AAR-87/02

GLOBAL NOTES

We at *The MAC Flyer* are privileged to announce the arrival of our new Deputy Director of Safety; (Carefulis Extremis), Col. Gary B. Koch. At the same time we are saddened as one of our own departs; Major Michael J. Iltis left for an education with industry assignment.

At McClellan, Colonel Koch was the Commander, 55th Weather Reconnaissance Squadron. Prior to that, he was Chief, Combat Readiness; Chief, Plans and Programs, and Assistant Director of Operations, 41st Rescue and Weather Reconnaissance Wing. We're excited about all the experience Colonel Koch brings to the Safety Directorate and look forward to working with him. Welcome aboard, Sir!

Major Iltis competed (successfully) for a slot in AFIT's Education with Industry program. He will work with Pratt and Whitney in Palm Beach, Florida. We tried to console Mike about this change of pace, but for some reason he was constantly wracked with violent contortions of laughter, and had a permanent grin on his face—obvious defense mechanisms. Despite his lack of grief at leaving us, we wish him Godspeed and good luck!

This may seem a bit callous, but appears to be an ideal place to plug an opening on *The MAC Flyer* staff. We *do* have room for a senior captain/junior major. Please see back cover for the exciting details.

Checklists and The Human Factor

By Capt. Frank Hawkins

Analysis shows about 80 percent of all civil aircraft accidents have *human factor* as a significant cause. Another recent study, based on NTSB and ICAO data, discloses the human element was a primary causal factor in almost all civil carrier approach and landing accidents surveyed. About 45 percent of accidents were attributed to unprofessional attitudes or behavior.

For us, as crewmembers whose whole professional task is safe transportation of people and property from one place to another, this is a message we cannot justifiably ignore.

Whether we are pilots or fill some other crew position, we are all personally responsible for facing these unpleasant findings and each of us should make a vital contribution in meeting the challenge.

The Human Factor

The old concept of *pilot error* is now largely discredited as a meaningful and constructive description of aircraft mishap cause. We gradually learned that behind so-called *pilot* error there was nearly always another human error a little further upstream.

More recently, discussion has focused on human capabilities, and—more significantly—on human limitations. Everyone now recognizes all humans, including pilots, are fallible: all have normal, human performance limitations. Yet, in the critical task of designing, testing, and operating commercial aircraft, we can no longer allow these known human limitations to result in a mishap.

Human factors must be taken into account in aircraft and equipment design—instruments, controls and so on—to ensure they are properly matched to the capabilities and limitations of those who will use them. During flight testing, the human factors of aircraft control are of primary concern. Preparation of cockpit procedures, distribution of tasks between crewmembers, presentation of information in manuals, maps, charts and other documents, all directly involve understanding human factors.

Human Performance

But at the end of the day, after proper human factors have been applied to equipment, procedures, and working environment, one weak link in the safety chain remains—the normal but variable and vulnerable human performance of the crewmember. He's been carefully selected, highly trained, and routinely checked; yet, he still remains human and subject to normal human limitations. We know, for example:

- Crewmember efficiency varies on a 24-hour cycle with a low point in the early hours of the morning at about 0400-0600 hours.

- Normal personal and emotional problems, as well as operational stresses, have an adverse effect on performance.
- Body rhythm desynchronization and sleep disturbance or loss cause a reduction in motivation and performance.
- Human short-term memory is rather poor, unreliable, and adversely affected by stresses such as fatigue.
- Familiarity tends to breed fallibility. Even after years of successful routine operation, memory can play quite rare tricks that defy rational explanation.

Under high workload conditions, fatigue errors are most likely to occur and most likely go undetected—leading to further, possibly critical, difficulties.

Perhaps the biggest problem we face in meeting the phenomenon of variable human performance is in most cases the person, at the time, *is not aware that his performance is reduced.* This reduction in performance is probably the greatest danger and requires the strongest preventive measures.

The Checklist

The most reliable protection against possible catastrophic effects of normal human performance variability is use of standardized operating procedures and the unfailing use of a checklist. The checklist enables the crewmember to shed some of the workload, thereby leaving more available capacity to deal with other matters requiring his expertise and attention. If properly used, the checklist provides an assurance of continuity and completeness when essential crew duties are interrupted by ATC or other outside responsibilites.

Yet, during one 13-year period, the NTSB attributed no fewer than 14 mishaps to failure to use the checklist, and many more to failure to apply published standard operating procedures. Many have died and a vast amount of material damaged as a result. To quote from just two reports: *'Cause of the accident was failure of the crew to follow checklist procedures'* and again, *'One of the two major contributory causes was the failure of the crew to satisfactorily complete checklist items.'*

Why then are checklists, even when available, sometimes not used? There are probably three main reasons:

Saving time, for commercial reasons. Yet, no responsible commercial manager would ever support such false 'economy' knowing the risks involved.

Trust in memory, as a matter of professional pride. A dangerous philosophy; we know human short-term memory is unreliable and easily subject to stress; furthermore, a person will not usually be aware of its deterioration.

Reducing workload. In fact, the checklist itself serves to reduce workload because the operational and technical principles and procedures upon which it is based have already been worked out, thus relieving the crew of this effort. A proper, efficient, cockpit design and work distribution *MUST* always include this essential checklist task.

In this now recognized vital task of protecting crews, passengers, and companies from the possibly castastrophic effects of failure resulting from normal human limitations, the *CHECKLIST* is the most effective tool. In its application, pilots at all levels have a part to play:

The Line Pilot. If the line pilot isn't happy with layout, presentation, sequencing, or any other technical aspect of the checklist, he should advise his chief pilot. The line pilot's experience and feedback is the most valuable source of practical information. As a responsible, professional pilot, he naturally insists on 100 percent use of the checklist in line operation by all crewmembers.

The Flight Instructor and Check Pilot. His is the task of communicating with line pilots and bringing them the benefits of his sources of knowledge to ensure routine understanding of and compliance with company procedures for checklist use.

The Chief Pilot. Acting as the bridge between the main sources of technical and specialized human factor knowledge and his company's pilots, he has the difficult task of processing information from both sides of the bridge. He also has the task of constantly supervising proper application of procedures and policies established by his department and he, no doubt, makes use of this and similar specialized bulletins to help him in this task.

Manufacturer's Director of Flight Operations. With the help of the factory operations support department, which often includes very experienced airline pilots, his task is to provide the airline with the best information available, and help solve those checklist problems where assistance or advice is needed.

As crewmembers, we must all work together to meet this challenge of the human factor in accidents. The CHECKLIST is the most powerful weapon we have at our disposal. But all the technical and human factor skills applied in checklist design is worthless unless it's used at every stage, on every flight.

Many human failures come within the normal range of human limitations. Failure to properly and regularly use a checklist does not. That aspect lies entirely in our own hands in the cockpit. ✈

Courtesy: *Flight Crew*

I Fly The Line

By Maj. Bill Sadler
1550 CCTW

I'm the guy who hauled the coal,
to the folks in West Berlin,
and when the paratroopers jump
I'm the one who takes them in.
I've plucked the stricken sailor
from the fury of the sea.
And when the President needs to fly,
the call goes out for me.
I've hauled supplies to Ecuador,
to ease the earthquake pain,
I've flown into the evil eye,
of every hurricane.
The fighter jocks who crossed the fence,
all went without a doubt,
That when they got in trouble,
I would come to pull them out.
I've hauled Marines to every place,
that sought a helping hand,
I carried tanks and jets to Lod,
when Israel made its stand.

I hauled the wheat to Africa,
to blunt Sahara's drought,
And when the gates of Saigon fell,
I hauled the friendlies out.
I've hauled the sick and wounded,
from every battle zone,
And never rested till I knew,
that every man was home.
I took the gallant warriors,
to their planes in Vietnam,
And brought their tiny caskets home,
from Hanoi's Gia Lam.
I was there with Delta Force,
that night at Desert One,
And when Grenada needed help,
I'm the one that got it done.
I've flown the poles both North and South,
I've flown the desert floor,
I've flown the world from East to West,
in peacetime and in war,
I'll tell you, sir, I've seen it all,
I've been to hell and back,
I'm the one who does the job,
I fly the line for MAC.

Excellence In Airmanship

Standing: (L to R) Capt. Mark C. Noyes MP, Capt. Earl L. Forest MC, Kneeling: (L to R) MSgt. Robert L. Hoak FE, Sgt. Greg M. Vaughn FE.

Capt. Mark C. Noyes and Crew, 71 ARRS, Elmendorf AFB, Alaska, were on a night water hoist, instructor pilot upgrade mission at Homer, Alaska, 1 April 1987, when their HH-3E developed a high frequency noise accompanied by a buzz in the flight controls. Although the noise and flight control buzz lasted only a short time, Captain Noyes elected to land at Homer Airfield, four miles east. As the aircraft turned, the buzz returned along with illumination of number 1 generator and number 2 transformer rectifier caution lights. As Capt. Earl L. Ernest, the copilot, started the generator failure emergency procedures checklist, flight engineers Sergeants Robert L. Hoak and Greg M. Vaughn examined the accessory section of the aircraft's main gearbox where the generator is located. Soon after Captain Noyes notified Homer Airfield of the pending emergency, a fire broke out in the aft section of the main gearbox shooting flames and sparks into the cabin area. The fire's intensity required Sergeant Vaughn to dart below the flames to the rear cabin area to retrieve a portable fire extinguisher. The fire continued despite use of both extinguishers. Because of the risk of landing in water or on rocky shores, Captain Noyes elected to continue to Homer, now two miles away, to perform a minimum-power running landing to the first available runway. During approach, Captain Ernest called out sink rate, airspeed, and power settings. Sergeants Hoak and Vaughn removed remaining parachute flares from the immediate fire area. Following landing, the crew accomplished emergency engine shutdown and egress checklists and evacuated the helicopter on the runway. The Homer fire department arrived shortly after and extinguished the fire. Later investigation revealed the helicopter experienced catastrophic number 1 generator failure. Following its failure, number 1 generator continued to turn, producing friction and heat resulting in ignition of lubricants and wire bundles. By their coordination and handling of a potentially disastrous emergency, this crew deserves the Excellence in Airmanship Award. *TMF* congratulates Captain Noyes and Crew on a job well done.

MANAGING THE

by Lt Col Michael G. May and
Capt Donald L. Rosenberry

We're swiftly moving into the home stretch in this 12-part series. We hope flight safety advocates throughout MAC have found value and some insight in how to strengthen unit safety consciousness. This article looks at aero club operations and should help enrich flight safety in these activities. However, principles that strengthen aero club programs are also applicable to all MAC flight safety offices. The guiding regulation is AFR 215-12. Pull it off the shelf for a few moments as we look at it together.

Before we review Chapter 5, take a look at paragraph 1-2, "Purpose of Aero Clubs." Here we find Air Force goals and objectives described as recreation, morale, safety, aeronautics, social, and TDY. We need to remind ourselves of our goals, not only in dealing with aero clubs, but in MAC operations as well. It's true, the safest way to ensure no mishaps occur is by doing nothing, but since this isn't an option for MAC, we have to deal with an inescapable human characteristic—we are all *subject to error.* Subject to error often translates into mishaps. We need to realize, then, that we're vulnerable to aero clubs mishaps if we try to achieve our stated goals. We can minimize our mishap potential by doing a combination of three things:

(1) Remove mishap potential from operations and systems,

(2) Develop procedures to prevent mishaps and,

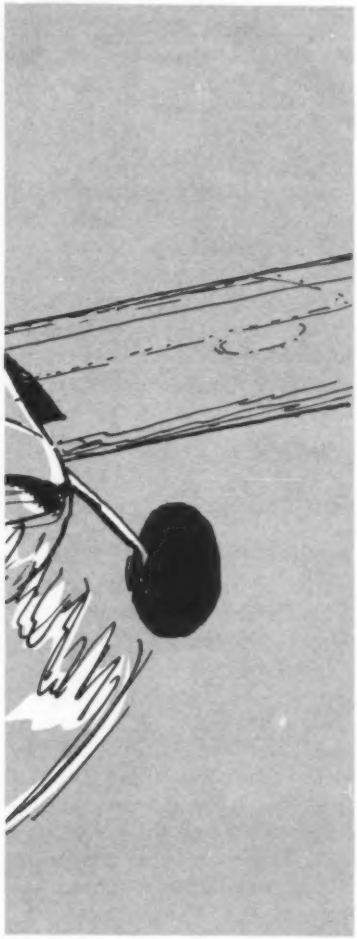
(3) Train (instruct) personnel on the mishap potential of specific operations.

This three-way mishap prevention strategy for aero clubs is detailed in Chapter 5 to ensure we do everything we can to prevent flight mishaps.

First of all, *the entire wing is involved* in aero club operations. This is one way we design mishap prevention into and mishap potential out of our system. Figure 2-1 depicts the broad involvement of base agencies, all committed to achieving stated goals through effective management. Even the wing commander has a direct interest in topnotch management. Notice the board of governors has a direct link to the wing commander and an advisory line to the aero club manager. Aero club operations must be carefully managed and the club manager is a central figure in the process. Wing flight safety officers can help managers realize how important they are in this function. Direction to club managers in supporting safety programs is clear in paragraph 2-4. However, no single person is tasked with the responsibility of mishap prevention—that duty is specified in the first line of Chapter 5: "Safety is every aero club member's responsibility." This statement puts the monkey right where it belongs—on the backs of club participants! It's the same as in the rest of MAC. We're each tasked with mishap prevention in everything we do. Commanders and supervisors, like the club manager, are key contributors to any successful safety program, along with everyone else. There are two pointers here flight safety officers can include in their self-inspection checklist. Make sure part of the club safety program emphasizes each person's individual responsibility for mishap prevention and, secondly, that club managers are totally committed to safety. Their commitment to strong safety programs is the first way to *minimize* mishap potential and *maximize* mishap prevention.

Another design feature which minimizes mishap potential is buying quality equipment. There's

AERO CLUB RISK



nothing better in crowded skies and unusual flight situations than having a good aircraft with up-to-date navigation aids and engine instruments. FSOs can help ensure clubs take this mishap prevention step.

Now that we've done everything we can to ingrain safety, let's take a look at how solid procedures help. In some circles, the term "compliance" doesn't exactly engender fond feelings. We all take pride in our abilities to perform correctly according to specifications, and indeed we should! We spend lots of money to learn from mishaps; perhaps someone didn't do his/her job. So, we develop procedures to tell us how to do that very important job correctly. Well-designed safety features reduce needed procedures by accomplishing safety actions automatically. Procedures become necessary when we can't, or don't, choose to automate. Wing FSOs need to be familiar with aero club procedures and include checks for compliance in their inspection activities. Paragraph 5-3 outlines the many duties of wing or base FSOs.

Inspection and follow-up are two very important responsibilities. If you think about it, you can't inspect unless you know what to inspect. This requires familiarity with the regs and checklist preparation. One can't always remember to look at everything during an

inspection; that's why checklists are important. We also know the word "inspection" has a very negative connotation for most people.

Let's look at inspections to see if we can change the way we feel about them. Example: You've just finished washing and waxing your new car. You step back with great admiration and walk around to make sure you didn't miss any spots—that everything is just right. That's a self-inspection, and it's good. This is the philosophy both inspector and inspectee should maintain throughout the process.

A solid unit inspection program can literally save lives, limbs, equipment, etc., etc. Compliance is good, inspections are good, and the procedures we establish to detail how a job is done must be learned and followed.

If we can't design-out all mishap potential, then take the last of three options and train people in mishap prevention. We tell people about pitfalls, stumbling blocks, and weaknesses of our system. FSOs, this is where your responsibility to provide mishap information becomes so important. You have a wealth of safety meeting experiences to share with aero club safety officers, and tips to offer for strengthening the club mishap prevention program. What we're talking about here is involvement. Like all other safety programs, their effectiveness is limited primarily by commitment and involvement. FSOs must get in and get dirty (so to speak) to really help the club fulfill its goals safely. If you lack experience, refer to the aero club file in your flight safety office. You should find previous higher headquarters' inspection findings of good and bad aero club programs. That's a way to get smart in a hurry, and a good source for developing your self-inspection checklist. Plus, read applicable regs so you know how the program is supposed to look. Guess what—you can also call your higher headquarters for advice. The DP folks are the experts in aero clubs in general, but we in safety can shed quite a bit of light on techniques to strengthen club safety consciousness.

Just a couple more tidbits. First, Air Force aero club accident rates have ranged from 2.5 to 7.2 per 100,000 flight hours since 1981 with an average rate of 4.8. In the first quarter of this year, we've experienced our worst start in history with an Air Force rate of 16.2. Needless to say, there's room for improvement in mishap prevention. MAC clubs have done exceptionally well, however, with no mishaps and three incidents through the second quarter of this year. We want to keep this good record going so let this article spur you to renewed involvement aimed at strengthening our safety programs and securing safer aero club operations.

The last item is a records keeping detail that has given several clubs big headaches at unit effectiveness inspection time. The problem comes when members miss mandatory safety meetings. If provisions of paragraph 5-5 are not strictly followed, noncurrent members could be allowed to fly. Examine AF Form 654s and cross-check those with 653s to ensure required reviews and briefings are accomplished, as well as signed. A small detail such as documentation can make an otherwise fine aero club operation look unsatisfactory.

Aero clubs are good deals for Air Force members, but the surest way to lose them is to have an inadequate safety program and lots of mishaps. It's your job, FSO, to ensure a quality, effective program for aero club mishap prevention. Good luck, FSOs, and for all you aero club members, happy flying!

CHANCE ENCOUNTER . . .

With the *one* and *only*.

"Okay, Bob, we'll be looking for you the next time you're up this way, take it easy pal," Mac MacKenzie said to his old buddy and college roommate, Bob Fergus. He watched as Bob climbed into the single engine light plane, cranked up, taxiied and took off into the late afternoon glare. Glad to see Bob doing so well, he thought. He was always a hard-charger; being a stockbroker looks pretty lucrative. I've got to start an investment program myself. Oh well, might as well stop and see if Bill can still spare that Cessna this weekend, he thought as he walked into the FBO at the local airport. As he entered the manager's outer office he heard what was apparently one end of an agitated and well amplified telephone conversation emanating from the manager's office.

"LOOK, YOU BUMPTIOUS BLUE-SUITED BUREAUCRAT, WHEN I SAID WE'LL BE THERE, WE'LL BE THERE. I'VE BEEN FLYING THIS TYPE OF MISSION SINCE YOU WERE CRAWLING AROUND IN WET KNICKERS . . . YEAH, I KNOW WHO YOU WORK FOR, I USED TO WORK FOR HIM TOO . . . WELL, YOU WON'T BE ABLE TO FIND ANYBODY ELSE, NOT FOR WHAT YOU'RE PAYING. NOW GET OFF MY BACK AND LET ME DO MY JOB.

"I tell you Cindy, I've waited 33 years to tell somebody off like that. It's always the same, the guy in the field with his rear end on the line is the last guy to call the shots. Just because Major Olive Norton works for you-know-who, she thinks she can talk to me like some kind of . . . ."

"Uh, excuse me, sir, I was looking for Bill Strong," interrupted Mac MacKenzie.

"Well, m'lad, my ole buddy Billy stepped down the hall. Call of nature and all that. He just let me use his office for a moment," replied the bald, somewhat portly gentleman standing next to the desk. He was wearing what appeared to be an old-style gray Air Force flight suit and well-worn military combat boots. Seated behind the desk was a young lady,

perhaps 30, with striking red hair, obviously dressed for flying, wearing a tailored light-blue flightsuit with a name tag reading C. I. Anderson over her right pocket, and what appeared to be a corporate logo over the left, with the initials CRTCCSAI embroidered in red on a dark blue background.

As he turned to face him, Mac was able to read the name tag on the faded flightsuit and for a moment was caught speechless. When he recovered, he was only able to stammer, "Uh, aren't you . . ." before the gentleman extended his hand and introduced himself.

"C. R. Terror, Major, USAF Retired, President and CEO of 'C. R. Terror Combat Cropdusting and Sensitive Airlift, Inc.' at your service. This is my copilot, and not-so-silent partner in this struggling venture, Ms. Cynthia Anderson."

The young lady rose and extended her hand to Mac across the desk, "Everyone calls me Cindy, Mister . . .? "

"Oh, excuse me. I'm Captain Mac MacKenzie, stationed just up the road, flight safety. Is that your C-54 on the ramp?"

"That's right m'boy. We're on a high-priority mission to deliver a load of . . . ." In an obvious effort to cut short his ruminations, Cindy began some rather loud coughing and gave C. R. a reproving look.

"Bibles. That's right, bibles. A humanitarian airlift of bibles." Obviously trying to change the subject, C. R. asked, "Say, do they still have those great 'killer cheese burritos' in the airport restaurant?"

"Yes sir, and the name 'killer' is appropriate. Do you really eat those things?"

"Never fear. Come along and I'll show you how a *real* airlifter eats," said C. R. as he headed out the door. Cindy looked at Mac, smiled, and shrugged her shoulders as if to say it's useless to preach.

Mac could only watch in awe as C. R. mopped up the last of a gigantic platter of cheese burritos "extra onions por favor" and two cans of BURPO cola. When he and Cindy completed their chicken club sandwiches and milk, his curiousity got the best of him and he found himself asking, "Maj—excuse me, Mr. Terror, weren't you involved in that Moldavian hostage rescue last year?"

"Certainly was, m'boy. Flew the lead ship. My final blow in defense of freedom. Those Hittite terrorists were no match for a real aviator such as yours truly. Simply no contest."

"It must be a real challenge to establish your own airline these days, what with deregulation and all the competition."

"Piece of cake, lad, piece of cake. With my vast airlift experience, worldwide connections, entrepreneurial expertise and a few highly placed frien . . . OW!" C. R. shrieked as Cindy kicked him in the shin. "My old trick knee acting up again," he said as he rubbed his knee while giving Cindy a sidewards glance.

"What's been your biggest problem?"

"Finding good people. There aren't too many true aviators left anymore. They just don't get their nose in the books and get to know their equipment like I always did. Why, I had one guy, hired him as a captain, no less, who almost succeeded in burning up my best airplane."

"Only airplane," added Cindy.

"Uh, yes, well. For some reason, this idiot felt the need to supplement the generous salary I was paying him with a little airborne

extracurricular enterprise. We were contracted to haul a party of 12 'individuals' to a remote . . . resort in another country," C. R. said, glancing at Cindy while shifting in his chair to avoid the chance of another kick. "He managed to get a couple of televisions and a VCR on the airplane and hooked everything up to one of those multiple strip outlets. He charged the passengers ten bucks a head for continuous movies, popcorn, and sodas. Well, when he went to plug it in, the whole contraption went up in a flash of smoke and flame. By the time they got the fire out, the airplane back on the ground, and the mess cleaned up, we were a week late and had to cough up a big late fee. This moron "forgot" the airplane was equipped with a 110 volt, 400 cycle, not 60 cycle system. Fried the whole works. Now, being an entrepreneur myself, I'm all in favor of free enterprise, but he just didn't take the time to study and understand his equipment. Certainly not the way I'm used to operating."

"Knowing your airplane is certainly important, but from what I've heard, there are plenty of good, eager pilots available."

"Well, eager maybe, but most of the good ones are working for the big boys. What shows up at my door isn't exactly the cream of the crop. For example, I had another lad, nice boy, seemed sharp, reminded me of me in a lot of ways. Anyway, he was my copilot on a trip to warmer climes. The weather was typical rainy season, about 500 and 2. Luckily, the airport had an ILS. Shortly after passing the outer marker, flags popped out all over the course indicator so I told this guy to check the circuit breaker. After what seemed like an eternity, I asked how he was doing. All I got was a blank stare. Obviously he couldn't find it and didn't have the foggiest notion where it was. I checked it and it was still in.

"I had a pretty good guess on our time over the marker so I decided to continue with an ADF. Approach control seemed rather busy, and I didn't want to bother them with such trifling details so I directed the copilot to dig out the approach plate just to double-check minimums. Just as he got the Jeps book on his knee the whole kit and kaboodle slid on the

floor; approach plates scattered everywhere.

"About that time we broke out and came face to face with the biggest radio tower I'd ever seen. He jammed the throttles forward and almost dislocated my shoulder in the process. I yanked the airplane into a tight turn and finally caught sight of the prettiest strip of blacktop I'd ever seen. I lined up, and was on short final when the tower started yelling that we were lined up on the taxiway! He jammed the throttles forward again, all the while yelling GO AROUND! GO AROUND!

"After two more circles of the field, I got the runways sorted out and landed. The weather closed in behind us and closed the field. It cost me a pretty penny buying Terrorific 'Tinis for all the pilots who were waiting to take off and got stuck. I'll tell you, you just can't find good help anymore."

"Ahem," interjected Cindy.

"Present company excluded, of course. Cindy showed up at my doorstep one day and said she was sent to straight . . . said she heard I needed pilots."

"C. R., it's about that time," Cindy said, pointing at the clock on the restaurant wall.

"Right you are m'lass. Right you are. Got a lot of folks waiting for those bibles," C. R. replied, rising and heading for the flightline door. Mac followed him and Cindy to the ramp entrance.

"It was a pleasure to see you again, sir. Stop at the office if you're this way again."

"Oh, I'll be around, m'boy. Keep up the work in safety. It's a fine calling. Always been a great believer in safety. Do it safely and by the book, that's my motto. See you on the flip-flop," C. R. responded as he shook Mac's hand. As he and his copilot turned and walked across the ramp, Mac could hear C. R.'s voice trailing off, "Cindy, m'lass, did I ever tell you about the three-engine takeoff I did in Old Shaky at Leopoldville? Well, of course I was tail-end Charlie, last plane out, always volunteered for the most dangerous missions. Anyway, the rebels were coming in the gate as we taxiied, and number three . . . ."

Mac waited and watched as the old Skymaster fired up and took off in the fading light, slowly turning south as it disappeared into the haze. ✈

There is time for a go-around option.

Pilots of large, heavy aircraft should be aware some of their primary means of control are significantly degraded, or even nonexistent, when landing on wet or icy surfaces.

Normal means of in-flight aircraft control, specifically the aerodynamic controls, lose effectiveness as the aircraft decelerates. As this happens, pilots must rely on lateral tire friction and wheel braking forces for directional control and stopping.

Control through tire friction works very well on dry runways, but under conditions in which there is little or no friction between tires and runway, control loss may occur as the airplane loses speed.

The first factor to consider in aircraft control during landing is inertia. An aircraft will continue its forward motion if overcome by one or more external forces, such as friction. When such forces are unavailable because of wet or icy conditions, aircraft deceleration becomes negligible. More importantly, ground contact forces may be inadequate for airplane directional control.

This is especially troublesome when a crosswind is present and ground traction forces have diminished. Depending on crosswind magnitude, pilots may be unable to maintain a straight course down the runway. In such situations, he/she must resort to engine power for control. In many circumstances, symmetrical reverse thrust is the preferred, and may be the only, method of slowing the airplane. When pilots select full reverse thrust, they're committed to a landing.

Asymmetric thrust could be used to provide directional control. This method requires judicious use because of its limited effectiveness. One reason is, in the case of the C-5's, high-bypass fan engines, only fan air is reversed. Another, more important reason, is when pilots select reverse thrust for one side only, the resulting thrust vector shifts to the side of the aircraft's center of gravity, and the vector is no longer parallel to centerline.

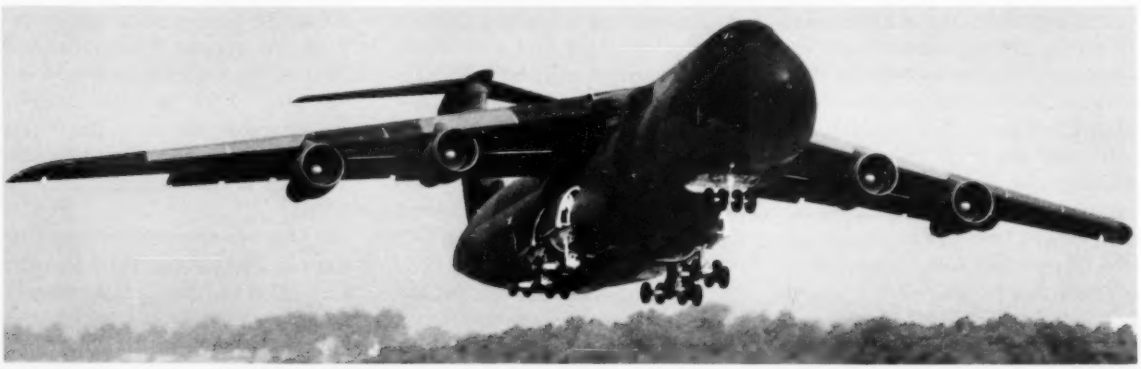
Use of asymmetric thrust during landing should be the last resort for aircraft control. If runway length permits, it would be better to increase landing speed to provide greater aerodynamic control at touchdown, and then slow the airplane with symmetrical reverse thrust using all engines.

Obviously, conditions can arise in which the most prudent action, after assessing inadequacy of ground directional or lateral control forces, would be to go-around for another approach. Pilots should recognize chances for correcting an off-course problem are proportional to maneuvering space.

From its centerline, only half the runway width is available for maneuvering. In contrast, the length of the runway may offer a distance 40 to 100 times longer than that available at either side; therefore, a go-around may be the preferred maneuver.

The following example of a landing roll and go-around timed history will illustrate this option. For example purposes, numbers given represent typical C-5A/B values.

Gross weight—500,000 lbs.
Field elevation—1,000 ft.
Ambient temp.—minus 5 degrees C.
Approach speed—(VAPP) 124 KCAS.
Runway length—9,000 ft.
Runway width—200 ft.



By Bernie J. Dvorscak
C-5B Project Pilot
Lockheed Georgia Co.

SEQUENCE	EVENT	TIME (seconds)	DISTANCE IN FEET (event)	(total)
1	Flare, touchdown	6	1180	1180
2	Deploy ground spoilers, reverse idle.	3	560	1740
3	Rollout for seven seconds, check tracking and braking; minimum speed 90 kts.	7	1100	2840
4	Decision - go-around	2	300	3140
5	Add TRT power, flaps 40 percent, retract spoilers, trim stab.	10	1700	4840
6	Accelerate to V_{ROT}	1	150	4990
7	Accelerate to V_{LOF}	3	650	5640

Figure 1

In summary, every landing has potential for a go-around if the pilot has proper regard for airspeed and remaining runway distance. In marginal crosswind situations, an alternate landing strip could be the wisest choice.

Good ground directional control depends primarily upon effective tire-to-runway friction, which quickly develops when ground spoilers are deployed, provided proper runway surface conditions exist.

Spoilers, thrust reversing, and anti-skid braking, all contribute to reducing landing distance; wheel brakes are the principal stopping devices on the runway, but as runway surface conditions deteriorate, reverse thrust becomes increasingly more effective as a means of stopping the airplane.

In the presence of crosswinds when ground reactions are degraded due to wet or icy runways, aircraft inertia and a crosswind may overpower available directional control. Before committing to a landing in adverse conditions, pilots should consider the go-around option and be prepared in advance for such an eventuality.

(Editor's note: Of course, the point of this article doesn't just apply to the C-5. The pilot of every airplane should understand the dynamics of the landing and stopping equation. Skill and knowledge, tempered by good judgment, are three key factors in that equation. The pilot who lets the first two factors deteriorate may not be capable of exercising the third.)

Adapted from: *Galaxy Newsletter*

Flying-Hour Milestones

5,000

Lt. Col. John T. Loughran, 9 MAS
Lt. Col. John D. Rhodes, 53 MAS
Lt. Col. Derle M. Snyder, 193 SOS/CC
Maj. Dennis A. Andrew, 57 MAS
Maj. Samuel E. Clonch, 300 MAS
Maj. Larry E. Bennett, 375 AAW/DO
Maj. Peyton T. Carr, 300 MAS
Maj. John H. Carter, 1 MAS
Maj. Thomas H. Despain, 185 TAS
Maj. John O. Foster, 15 MAS
Maj. James R. Frazier, 40 TAS
Maj. Kenneth L. Hopfer, 185 TAS
Maj. William F. Lott, 185 TAS
Maj. Robert C. Melrose, 185 TAS
Maj. Jacob P. Miller, 14 MAS
Maj. Jack M. Snyder, 1 HS
Capt. Marion J. Hamilton, 40 TAS
Capt. James V. Queen, Det 1, 89 MAW
CMSgt. Andrew L. Nedorolik, HQ MAC/DOT
SMSgt. Richard A. Arcara, 328 TAS
SMSgt. Edward D. Daily, Det 1, 89 MAW
SMSgt. Richard N. Fischer, 328 TAS
MSgt. Marcel R. Belanger, 17 TAS
MSgt. Howard D. Hall, 57 MAS
MSgt. Frederick A. Moorhouse, Det 1, 89 MAW
MSgt. Jeffrey L. Nissen, 40 TAS
MSgt. William F. Ressler, Jr., 75 MAS
MSgt. Stuart A. Williams, 15 MAS
TSgt. Randy L. Cameron, 185 TAS
TSgt. Richard Z. Hill, Jr., 130 TAS
TSgt. Charles E. McClatchey, 15 MAS
TSgt. William J. Niedzwiecki, 1 MAS
TSgt. David W. Saucier, 14 MAS
TSgt. George M. Shartzer, 57 MAS
SSgt. James G. Billingsley, 375 AAW
SSgt. Carl L. Geller, 15 MAS
SSgt. Stephan A. Koza, 14 MAS
SSgt. Richard L. Marquardt, 55 ARRS

2,500

Capt. Donald P. McDermott, 1 HS
Capt. Alberto L. Perez-Vergara, Det 24, 40 ARRS

Ranks and units are those at time of award. See MACR 900-3 for details on how to apply for your own milestone award.

QUICKSTOPPERS

VYSINE, ANYONE?

The C-5A crew was on a local proficiency sortie and had just flown an approach and touch and go landing before leaving for further transition training at another field. At 6,000 ft, first the scanner, then the instructor engineer, student engineer, pilot, and copilot experienced eye irritation. Crewmembers donned oxygen masks and the pilot directed the copilot coordinate the return trip. Soon after donning the masks, the eye irritation disappeared, although the scanner, instructor engineer, and student engineer continued to experience a dull headache throughout the rest of the mission.

After an uneventful landing, all crewmembers were placed in DNIF status by the flight surgeon until the following morning. The investigation revealed the left water separator outlet duct had a 15-inch hole between the aux vent valve and mixing chamber duct fittings. This hole had been temporarily repaired with a silver colored cloth duct tape and a green cloth masking tape wrapped around the duct and insulation on the exterior of the duct. These wrappings were then bolstered with fiberglass tape—a somewhat questionable form of repair. Prior to takeoff, the air conditioning system pumped out hotter than normal air and an oily smell which disappeared when the crew turned the air conditioner packs off and back on. Shortly thereafter, the engineer received an indication of air conditioning overheat. This also was fixed when he reset the packs. In all probability, the duct tape deteriorated due to excessive heat and caused the noxious fumes.

QUICKSTOPPERS

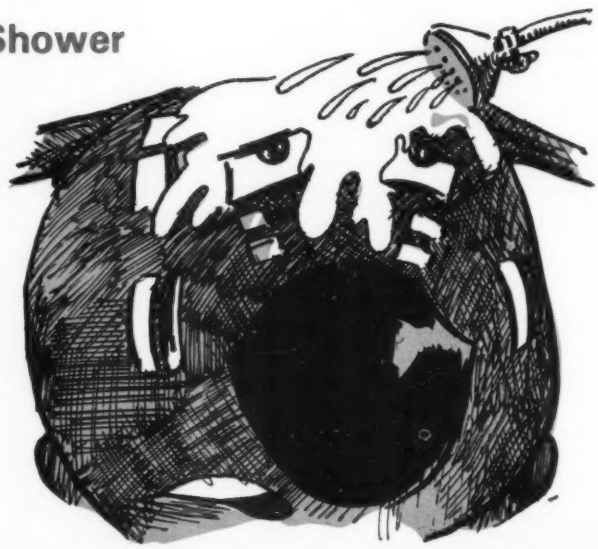
LET'S BE CAREFUL UP THERE!

The C-141 was cleared for visual approach to Howard AFB, Panama. While on a right downwind at 3,000 ft., Panama Approach advised them a conflicting Piper Seneca, climbing out of 2,000 ft at 11 o'clock, had visual contact. But as the C-141 crew made visual contact with the Piper, the copilot noticed a Boeing-737 not more than a mile away at about 12 o'clock. The 737 was initially heading east and made a right turn to approximately 180 degrees. Panama Approach notified our heroes the 737 was assigned an altitude of 4,000 ft. Tapes showed the civil airliner was, indeed, assigned 4,000 ft MSL, and the C-141 assigned 3,000 ft; both pilots reported complying with these altitude requirements.

Remember, this unresolved conflict highlights an important factor. Panama does not have altitude readout capability and relies on pilot compliance and accurate reporting for deconflicting its numerous VFR aircraft.

Polluted Shower

The C-130 was on a low-level tactical training mision. During low-level flight, the suction boost hydraulic line between the pump and pressure switch ruptured and sprayed hydraulic fluid inside the cargo compartment. The aircrew immediately went on oxygen. The crew then returned the airplane to base for maintenance and the loadmaster, who had been briefly exposed to the hydraulic vapor, checked with the flight surgeon. Investigation revealed the suction boost pump light hydraulic line between the hydraulic pump and light switch ruptured. There's strong suspicion that at some time or other this small diameter exposed line sustained an external force which weakened the line and caused it to eventually rupture. This rupture allowed low pressure hydraulic fluid to invade the aircraft. Beware the line that bites.



MY ACHING . . . .

This HC-130 copilot's seat had a mind of its own. Just couldn't find a comfortable position. . . . the seat that is, not the copilot. At least three times during this five-hour training mission, the seat readjusted itself from full-up to full-down. Each time, ever helpful crewmembers returned the seat to its proper position and insured the track pins were properly seated in the selected position. Following the seat's third collapse, the unfortunate copilot experienced muscle spasms as a result of misalignment of the lower vertebra. Investigation revealed the aircraft had armor plating installed on both pilot seats without heavy-duty springs (designed to counteract additional load of the armor on the track pins). A heavy suit of armor . . . .

WHAT GOES UP, MUST COME DOWN?

When the landing gear of this C-21A was lowered, the gear failed to indicate 'down and locked.' Left and right main green lights indicated on with all three red unsafe lights on. Hydraulic pressure indicated zero. The AC declared an emergency and the crew successfully accomplished alternate gear extension/hydraulic system failure checklists. Afterward, the pilot made a normal full-flap landing with normal braking, thanks to residual pressure. After the aircraft stopped, hydraulic fluid was observed leaking from the left gearwell. Maintenance experts discovered three bent hydraulic lines and a hole in another line. These lines were probably damaged during a flap modification to the wing. One was bent in a way that allowed the retracted flap track to apply pressure against the flap interconnect cable. The steel cable chafed the aluminum hydraulic line causing a hole in the line . . . "Spinning wheels got to go around."

Where are you? We know you're out there, but we rarely hear from you! *WHO?* All you flyers out there with those great tales of spine-tingling personal experiences, hair-raising emergencies, insightful safety philosophies, helpful techniques, and a host of other flight safety related topics rambling around in your cerebral cavities, *THAT'S WHO!* That's right, this is a blatant pitch for articles for your favorite flight safety magazine, *The MAC Flyer.* We've noticed a drop in article submissions from the field lately and we know there are at least 8 million stories out there (remember *The Naked City?*). We don't need that many, but do need yours to give *TMF* that first-hand, up-to-date, JP-4-soaked smell of the MAC crew force. Granted, we *TMF* staff members are premier writers and aviators *par excellence,* but the greatest hazard we usually face is the food in the snack bar downstairs. You, however, are out there where the action is, on the front lines, in the trenches, staring down the enemy, on the cutting edge of democracy, toe-to-toe with the Commies . . . .

AFTER DEADLINES

THE 13th TAKES WING—MAC's newest flying squadron, the 13th Military Airlift Squadron, will be activated 1 October 1987 at Kadena AB, Japan. The unit, flying C-12Fs, serving as the centerpiece for the Pacific Distribution System, will deliver spare fighter aircraft parts to bases throughout the Pacific theater. Since most fighter aircraft parts weigh less than 75 pounds and are smaller than 10 cubic feet, the C-12s are ideally suited to the parts delivery role. The unit replaces Detachment 2, 1403d MAS, and will use two C-12s presently at Kadena and four others previously based at Langley AFB, Virginia.

NEW GUNSHIPS ON THE WAY—The Air Force awarded a $155 million contract to Rockwell International, North American Aircraft Operations, Palmdale, California, for the AC-130U aircraft research and development effort. Production options call for eleven additional aircraft. The first new gunship, equipped with 105mm, 40mm, and 25mm weapons and fire control sensors, will roll out of the contractor's facility in 1990. It will undergo 10 months of flight testing at the Air Force Flight Test Center, Edwards AFB, California, prior to assignment to the 1st Special Operations Wing, Hurlburt Field, Florida, in 1991. All gunship airframes will be new C-130H models built by Lockheed-Georgia Co., Marietta, Georgia.

THEY'RE FINISHED!!—The 12-year program to modify C-5A wings, adding 30,000 flight hours to the Galaxy's service life, was completed 7 July 1987 with return of the last modified airplane to MAC. The $1.5 billion modification project involved installation of new inner, center, and outer wing boxes, comprising most of the C-5A's wing. Prior to delivery, Maj. Gen. Lewis Curtis, commander, San Antonio Air Logistics Center, stated "The C-5A fleet is now structurally healthy and for the first time in 17 years we can proudly say the fleet is operating without flight or load restrictions. The benefit to the Air Force and other services cannot be overemphasized. With the completion of the wing modification, the Galaxy, the Air Force's largest airlifter, will proudly fulfill its role into the 21st century."

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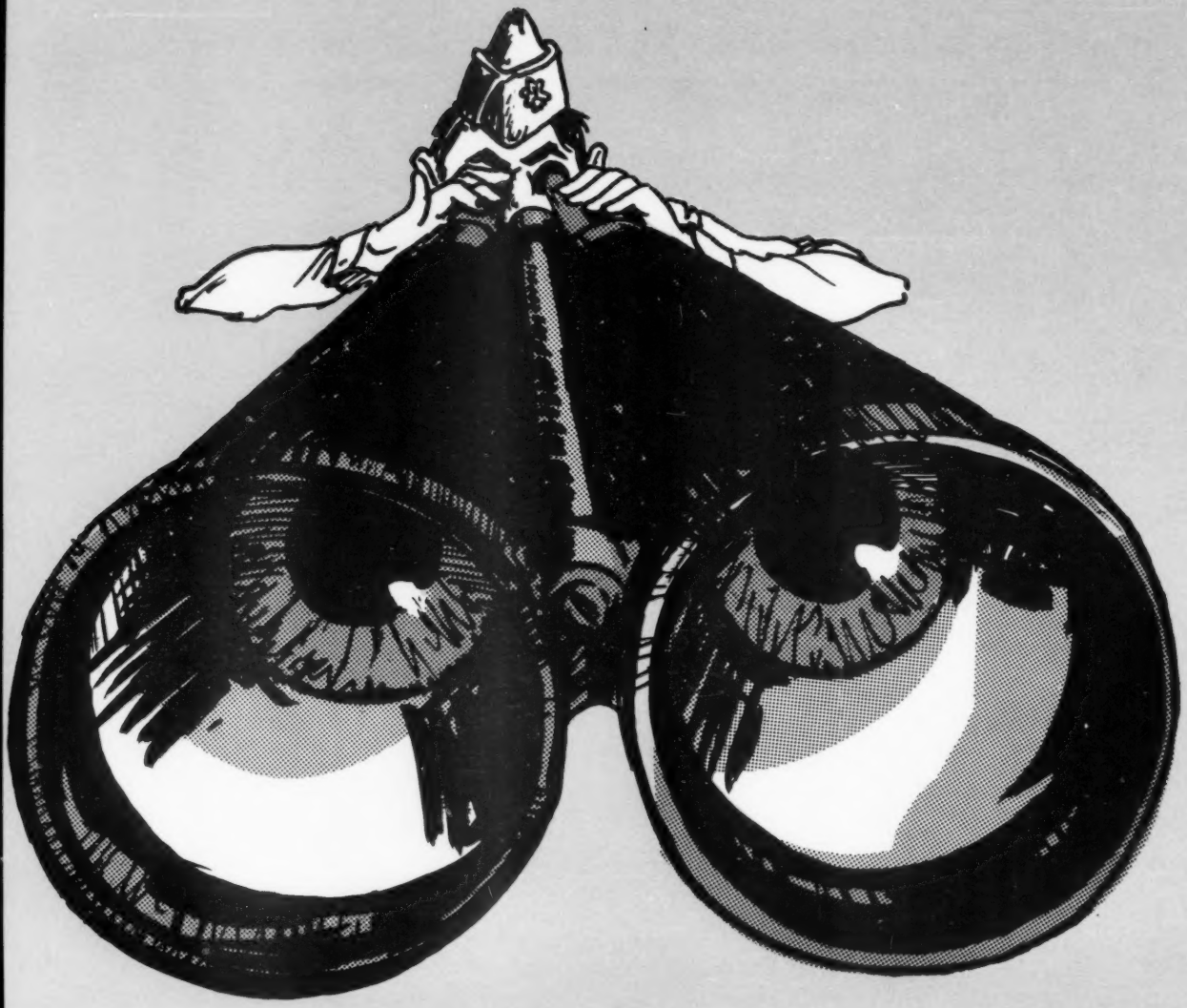

THANK YOU FOR YOUR SUPPORT. **Your response to our search for two new associate editors was great. However, due to such factors as restrictions on CONUS moves and flying gate problems, we've had to turn down some highly qualified people. The next several years will see a dramatic evolution in *The MAC Flyer* as we look at getting new hardware and software, as well as incorporating new production techniques. You can be part of our team, meeting new challenges with a tangible product to show for your efforts. Safety or a journalistic background aren't required, but certainly won't hurt your chances. So, if you're a rated captain/junior major, have met your first gate, believe you can write, and would like to work on the world's best flight safety magazine, give us a call today at Autovon 576-3534 or Commercial (618) 256-3534. Reporting dates will depend on how quickly you can pack.**